

The completed and signed proposal should be submitted by the Dean's Office to: curriculumplanning@asu.edu. Before academic units can advertise undergraduate concentrations or include them in their offerings as described in the university catalogs, they must be recommended for approval by the Senate Curriculum and Academic Programs Committee and approved by the Executive Vice President and Provost of the University.

Definition and minimum requirements:

A concentration is a formalized selection of courses within a major.

- A concentration requires a minimum of 15 semester hours of which at least 9 semester hours must be upper division. Specialized concentrations (e.g., BIS Concentrations) may have additional or different requirements.
- A concentration is offered by a single unit and is intended exclusively for students pursuing a particular major. If a concentration consists of courses from more than one college the approval of each college Dean is required.

College/School/Institute: College of Liberal Arts and Sciences

Department/Division/School: School of Life Sciences

Proposing Faculty Group (if applicable):

If this is an official joint degree program? No, this is not a joint degree program

If "Yes" List all the additional college(s)/school(s)/institute(s) that will be involved in offering the degree program and providing the necessary resources. Note: All units offering this program must have collaborated in the proposal development and completed the appropriate unit and college/school approvals.

Existing Degree and Major under which this concentration will be established: BS Biological Sciences

Proposed Concentration Name: Biomedical Sciences

What is the first catalog year available for students to select on the undergraduate application for this this program? 2015-16

Delivery method: On-campus only (ground courses and/or iCourses)

Note: Once students elect a campus or On-line option, students will not be able to move back and forth between the on-campus and the ASU Online options. Approval from the Office of the Provost and Philip Regier (Executive Vice Provost and Dean) is required to offer programs through ASU Online.

Campus/Locations: indicate all locations where this program will be offered.

- Downtown Phoenix Polytechnic Tempe West Other:

Proposal Contact

Name: Miles Orchinik **Title:** Assoc. Director, Undergraduate Programs, SOLS
Phone number: 965-4321 **Email:** orchinik@asu.edu

DEAN APPROVAL(S)

This proposal has been approved by all necessary unit and College/School levels of review. I recommend implementation of the proposed organizational change.

College/School/Division Dean name: Paul LePore

Signature _____ **Date:** / /20

College/School/Division Dean name:
(if more than one college involved)

Signature _____ **Date:** / /20

Note: An electronic signature, an email from the dean or dean's designee, or a PDF of the signed signature page is acceptable.

1. OVERVIEW

- A. Provide a brief description of the new concentration (including the specific focus of the new concentration, relationship to other concentrations in this degree program, etc).

This Biomedical Sciences concentration within the School of Life Sciences will serve our undergraduate students who aim to pursue career interests in health professions and biomedical research. The proposed concentration and curriculum will align with the 2009 Report of the AAMC-HHMI Committee which identified scientific competencies that premedical students should demonstrate before entry into medical school. In addition to integrative course work in biological sciences, interdisciplinary sciences, medical humanities, and communication, the concentration and curriculum will emphasize defined areas of knowledge, scientific concepts, and skills. Upon completion of the BS in Biological Sciences with a concentration in Biomedical Sciences, students will demonstrate knowledge of and ability to use basic principles of biology, biochemistry, chemistry, mathematics, physics and statistics needed for the application of the sciences to health and disease. Recognizing that medical schools, graduate schools, and health professions require the ability to deal with rapidly changing scientific knowledge, the Biomedical Sciences concentration will emphasize core, critical intellectual skills necessary to succeed. It will offer a robust liberal arts education that values, reinforces, and integrates analytical thinking, reasoning, quantitative assessment, and analysis of complex systems in biology.

- B. Explain the unit's need for the new concentration (e.g., market demand, research base, direction of the discipline, and interdisciplinary considerations). How will the new concentration complement the existing degree program?

Approximately 70% of freshmen entering the School of Life Sciences identify themselves as "pre-med." However, a large fraction of pre-med students in Arizona choose to attend the University of Arizona because of the archaic perception that the med school in Tucson provides better technical training for pre-med students. Given the change in emphasis of the top medical schools and the MCAT from coursework to broad competencies, the Biomedical Sciences concentration is an excellent opportunity for ASU to break down an inaccurate stereotype. This concentration in the School of Life Sciences will provide future physicians the full range of competencies desired by medical schools. The proposed concentration is similar to the Genetics, Cell and Developmental Biology, and the Neurobiology, Physiology and Behavior concentrations within the Biological Sciences degree program. However, it will be more visible to pre-med students in Arizona, and it will streamline the program of study in accordance with the changing demands on undergraduate education for future physicians. The new concentration emphasizes a strong and broad liberal education with a depth of knowledge and critical intellectual skills necessary for professional success. It will help those seeking premedical education or a career path in biomedical research to achieve analytical and scientific thinking skills needed to effectively address societal problems of health and disease.

2. Support and Impact

- A. Provide a supporting letter from the chair of the academic unit verifying that the proposed concentration has received faculty approval through appropriate governance procedures in the unit and that the unit has the resources to support the concentration as presented in the proposal, without impacting core course resources.

See attached letter from Brian Smith, Director, School of Life Sciences

- B. Identify other related ASU programs and outline how the new concentration will complement these existing ASU programs. (If applicable, statements of support from potentially-affected academic unit administrators need to be included with this proposal submission.)

Medical schools do not favor highly specialized technical degree programs, and they will admit qualified students from almost any degree program in CLAS. However, over the last 10 years, the majority of ASU students who have attended medical school have graduated from the School of Life Sciences. A significant number of students also attend medical school from the Medicinal Chemistry concentration within Biochemistry but that concentration is very different from what we propose.

- C. Provide a supporting letter from each college/school dean from which individual courses, or the entire concentration, are taken.

3. Academic Curriculum and Requirements

- A. List the knowledge, competencies, and skills (learning outcomes) students should have when they complete this proposed concentration. Examples of program learning outcomes can be found at (<http://www.asu.edu/oue/assessment.html>).

Learning outcomes are based on the core concepts and competencies identified in the 2009 Report of the AAMC-HHMI Committee on premedical education, and Vision and Change in Biology Undergraduate Education: A Call to Action. Graduates of the Biological Sciences- Biomedical Sciences concentration will be able to:

1. demonstrate knowledge of and ability to use basic principles in biology including concepts in genetics, cell biology, and physiology for the application of the sciences to health and disease
2. express practical understanding of the process of science, including how to read and critically examine current biomedical literature, develop hypotheses, design and conduct experiments, and quantitatively assess and analyze data
3. use written and oral communication skills to effectively communicate scientific concepts in biology to others with varying levels of scientific literacy
4. apply concepts in chemistry, organic chemistry, biochemistry, physics, and mathematics to complex biological problems.

Biology educators are developing more sophisticated and comprehensive assessments, but initially, we will assess program success using the following criteria:

We will assess our success initially using the following criteria:

OUTCOME 1: Able to conduct a lab experiment, as evidenced by ability to:

- identify, describe, and apply the processes of science, including basic techniques such as the use of controls
- select and defend the appropriate scientific methodology either to test a given hypothesis and prediction or to answer a given question as it relates to a descriptive study
- distinguish between information that is recognized as well established (beyond reasonable doubt) versus information that is tentative
- evaluate whether data support a particular hypothesis
- evaluate the validity of hypotheses and predictions put forth by other researchers

Measure 1.1: Will create scenario with response questions (addressing above competencies) for BIO 281

Performance Criterion 1.1: 75% of students will master above competencies in BIO 281

Measure 1.2: Final lab assignment in BIO 282 (will address above competencies)

Performance Criterion 1.2: 75% of majors will master above competencies in BIO 282

OUTCOME 2: Will demonstrate general competency in genetics, as evidenced by ability to:

- Identify and describe major elements of the molecular anatomy of genes and genomes.
- Deduce information about genes, alleles, and gene functions from analysis of genetic crosses and patterns of inheritance.
- Deduce information about genes, alleles, and gene functions from analysis of genetic crosses and patterns of inheritance, as evidenced by ability to:
- Infer modes of trait inheritance from human pedigrees
- Evaluate hypotheses about genetic transmission by applying statistical tests to the results of crosses

Measure 1.1: Will create scenario with response questions (addressing above competencies) for BIO 340

Performance Criterion 1.1: 75% of students will master above competencies in BIO 340

B. Provide the admissions criteria for the proposed concentration. If they are identical to the admission criteria for the existing major and degree program under which this concentration will be established, please note that here.

The admissions criteria for the Biomedical Sciences concentration is identical to the admissions criteria for the existing Biological Sciences degree program under which this concentration is established.

C. Provide the curricular structure for this concentration. Be specific in listing required courses and specify the total minimum number of hours required for the concentration.

| Required Core Courses for the Degree/Major | | | | |
|--|--------|--|-----------------------|--------------|
| Prefix | Number | Title | Is this a new Course? | Credit Hours |
| BIO | 189 | Life Sciences Career Paths | No | 1 |
| BIO | 281 | Conceptual Approaches to Biology for Majors I | No | 4 |
| BIO | 282 | Conceptual Approaches to Biology for Majors II | No | 4 |
| BIO | 340 | General Genetics | No | 4 |
| BIO | 345 | Organic Evolution | No | 3 |
| <i>Section sub-total:</i> | | | | 16 |
| Required Concentration Courses | | | | |
| Prefix | Number | Title | Is this a new Course? | Credit Hours |
| BIO | 312 | Bioethics | No | 3 |
| BIO | 353 | Cell Biology | No | 3 |
| BIO | 360 | Animal Physiology | No | 3 |
| | | | (Select one) | |
| <i>Section sub-total:</i> | | | | 9 |
| Elective Concentration Courses – Complete 2 Courses | | | | |
| Prefix | Number | Title | Is this a new Course? | Credit Hours |
| BIO | 351 | Developmental Biology | No | 3 |
| BIO | 420 | Immunology: Molecular and Cellular Foundations | No | 3 |
| BIO | 440 | Functional Genomics | No | 3 |
| BIO | 462 | Endocrine Physiology | No | 3 |
| BIO | 467 | Neurobiology | No | 3 |
| <i>Section sub-total:</i> | | | | 6 |
| Other Concentration Requirements | | | | Credit Hours |
| <i>E.g. – Capstone experience, internship, clinical requirements, field studies, foreign language skills as applicable</i> | | | | |
| Approved Electives. Must take at least one from each category below. At least one course must be a lab course. BIO/MIC/MBB/PLB 495 Undergraduate Research or an approved BIO/MIC/MBB/PLB 484 Internship may substitute for one lab course. Core Electives not used to satisfy requirements above can be used for Approved Elective credit where appropriate. | | | | 5-7 |

| <p>1) Biomedical Research:</p> <p>BIO 342 General Genetics Laboratory 2</p> <p>BIO 343 Genetic Engineering and Society 4</p> <p>BIO 352 Laboratory in Vertebrate Developmental Anatomy 2</p> <p>BIO 355 Introduction to Computational Molecular Biology 3</p> <p>BIO 361 Animal Physiology Laboratory 2</p> <p>BIO 415 Biometry 4</p> <p>BIO 435 Research Techniques in Animal Behavior 3</p> <p>BIO 450 Advanced Developmental Biology 3</p> <p>BIO 451 Cell Biotechnology Laboratory 4</p> <p>BIO 455 Introduction to Comparative Genomics 3</p> <p>MIC/MBB 446 Techniques in Molecular Biology/Genetics Lab 2</p> <p>MIC 421 Experimental Immunology 2</p> <p>MIC 425 Advanced Immunology 3</p> | | | | |
|--|---------------|---|-----------------------------|--------------------------------------|
| <p>2) Medicine in Society</p> <p>ASB 301 Global History of Health 3</p> <p>ASB 355 Traditional Medicine and Healing 3</p> <p>ASB 443 Cross Cultural Studies in Global Health 3</p> <p>ASB 452 Community Partnerships for Global Health 3</p> <p>ASM 345 Disease and Human Evolution 3</p> <p>BIO 302 Cancer - Mother of All Diseases 3</p> <p>BIO 311 Biology and Society 3</p> <p>HPS 331 History of Medicine 3</p> <p>SSH 401 Health and Human Biology 3</p> <p>SSH 404 Medical Anthropology: Culture and Health 3</p> | | | | |
| Related Area | | | | |
| Prefix | Number | Title | Is this a new Course | Minimum Credit Hours Required |
| CHM | 113 | General Chemistry I (4) | No | 4 |
| CHM | 116 | General Chemistry II (4) | No | 4 |
| CHM | 231 | Elementary Organic Chemistry (3) and CHM 235 Elementary Organic Chemistry Lab (1) | No | 4 |
| BCH | 361 | Principles of Biochemistry (3) and BCH 367 Elementary Biochemistry Lab (1) | No | 4 |
| PHY | 101 | Introduction to Physics (4) | No | 4 |
| MAT | 251 | Calculus for Life Sciences (3) | No | (3)* |

| | | |
|--|----|--------------|
| STP 231 Statistics for Life Science (3) | No | 3 |
| *MAT hours should count towards University hour requirement and not towards major hours. | | |
| <i>Section subtotal:</i> | | 23 |
| Total minimum credit hours required for concentration | | 59-61 |

D. A minimum residency requirement: How many hours of the concentration must be ASU credit?

15 hours

E. Provide a brief course description for each new course.

Note: All new required courses should be submitted in Curriculum Changemaker and ready for Provost's Office approval before this concentration is put on the CAPC agenda.

none

4. Administration and Resources

A. How will the proposed concentration be administered (including admissions, student advisement, retention, etc.)?

Same as all our other majors and concentrations- Under the direction of Scot Schoenborn, the SoLS Advising Office will continue to support the advising needs of our Biological Sciences students, including the Biological Sciences-Biomedical Sciences students. The SoLS Advising Office will work in conjunction with SoLS Undergraduate Programs to continue to increase retention in our existing and new concentrations. The admission requirements for this concentration will be the same as they are for all programs within the School of Life Sciences.

B. What are enrollment projections for the next three years?

| | 1st Year | 2nd Year (Yr 1 continuing + new entering) | 3rd Year (Yr 1 & 2 continuing + new entering) |
|-----------------------------------|----------------------------|--|--|
| Number of Students (Headcount) | 100 | 250 | 400 |

C. What are the resource implications for the proposed concentration, including any projected budget needs? Will new books, library holdings, equipment, laboratory space and/or personnel be required now or in the future? If multiple units/programs will collaborate in offering this concentration please discuss the resource contribution of each participating program. Letters of support must be included from all academic units that will commit resources to this concentration.

We expect to have increased enrollment in several large upper-division courses - Required Concentration Courses and Elective Concentration Courses. This will require us to allocate additional TAs to these courses. If possible, we will cover the additional TA lines with SOLS undergraduate program fees.

D. Please list the primary faculty participants regarding this proposed concentration. For interdisciplinary concentrations, please include the relevant names of faculty members from across the University.

| Name | Title | Area(s) of Specialization as they relate to proposed concentration |
|---------------------|--------------|---|
| Ben Hurlbut | Asst. Prof | Bioethics |
| Pierre Deviche | Prof | Endocrinology |
| Miles Orchinik | Assoc. Prof | Physiology |
| Jeanne Wilson-Rawls | Assoc. Prof | Developmental Biology |
| Jason Newbern | Asst. Prof | Neurobiology |
| Ken Buetow | Prof | Genomics |

5. Additional Materials

- A. Prepare and attach a Major Map. Please use the "proposed map" function to create a Major Map in BAMB. This feature is explained in the training document available on help.asu.edu.
- B. *Complete and attach the Appendix document.*
- C. Attach other information that will be useful to the review committees and the Office of the Provost.

**APPENDIX
OPERATIONAL INFORMATION FOR UNDERGRADUATE CONCENTRATIONS**

(This information is used to populate the Degree Search/catalog website.
Please consider the student audience in creating your text.)

Proposed Concentration Name: Biomedical Sciences

1. Program Description (150 words maximum)

The biomedical sciences concentration serves students in the biological sciences BS degree program who wish to pursue careers in medicine, other health professions, or biomedical research in an academic, clinical or industry setting. The curriculum aligns with the broad scientific competencies recommended for premed students in a report of the American Medical Colleges and the Howard Hughes Medical Committee and reflected in the 2015 changes to the Medical College Admission Test (MCAT). Course work draws from the school's concentration in genetics, cell and developmental biology and the concentration in neurobiology, physiology and behavior, with the addition of courses in biology and in medicine and society. The concentration focusses on the chemistry, biochemistry, math and physics coursework that is necessary to prepare students for the MCATs or medical school admissions. The concentration emphasizes core concepts, competencies and critical intellectual skills necessary to succeed in medical school or biomedical research.

2. Contact and Support Information

Office Location (Building & Room): LSC 206

Campus Telephone Number: 480/727-6277

Program email address: sols.advising@asu.edu

Program website address: https://sols.asu.edu/

3. Additional Program Description Information

A. Additional program fee required for this program? Yes No

B. Does this program have a second language requirement? Yes No

4. Delivery/Campus Information

Delivery

On-campus only (ground courses and/or iCourses) (check campus(es)/locations below)

ASU Online only (all courses online)*

Both on-campus and **ASU Online***

** Note: Academic units must obtain prior approval from the Office of the Provost and Philip Regier (Executive Vice Provost and Dean) to offer programs through ASU Online.*

Campus(es) and/or Locations Check all locations where the program will be offered.

- | | |
|---|--------------------------------------|
| <input type="checkbox"/> Downtown | <input type="checkbox"/> Polytechnic |
| <input checked="" type="checkbox"/> Tempe | <input type="checkbox"/> West |
| <input type="checkbox"/> Other (please specify) | |

Operational information: Once students elect a campus or On-line option, students will not be able to move back and forth between the on-campus the ASU Online option.

5. **Career Opportunities & Concentrations** Provide a brief description of career opportunities available for this degree program with the proposed concentration.

Upon completion of the biological sciences, biomedical sciences concentration degree students will be well-equipped to enter into careers as research scientists or as scientists in the health professions. Upon completing the biomedical sciences concentration students will have met the majority of prerequisite requirements and mastered many of the competencies valued by graduate programs in medical, dental, physician assistant, physical therapy and optometry. Additionally, graduates of this program will have an understanding of the process of science preparing them for a career in research. Students will have knowledge of foundational concepts in biological sciences, chemistry, physics and statistics, as well as the ability to understand and apply core biomedical concepts. This will prepare students to enter into biology research in a vast number of areas including, but not limited to, genetics, genomics, evolution, physiology and immunology.

6. **Additional Admission Requirements** If applicable list any admission requirements (freshman and/or transfer) that are higher than and/or in addition to the university minimum undergraduate admission requirements.)
none

7. **Keywords** List all keywords used to search for this program. Keywords should be specific to the proposed program. premed; pre-med; pre-medical; premedical; medicine; medical; med school; biological sciences; biology; biomedical sciences; medical biology

8. **Advising Committee Code** List the existing advising committee code associated with this degree.
BS in Biological Sciences (LABSCBS) assigned to the Liberal Arts Life Sciences (UGASLS)

9. **Western Undergraduate Exchange (WUE) Eligible:**

Has a request been submitted to the Provost by the Dean to consider this degree program as eligible for WUE? No

Note: No action will be taken during the implementation process with regards to WUE until approval is received from the Provost.

10. **First Required Math Course** List the first math course required in the major map.
STP 231

11. **Math Intensity**

- a. List the highest math required on the major map. (This will not appear on Degree Search.)
MAT 251
- b. What is the math intensity as indicated by the highest math required on the major map? Math intensity categorization can be found here: <https://catalog.asu.edu/mathintensity>
Moderate

12. **CIP codes**

- a. Identify CIP codes that should be displayed on Degree Search. CIP codes can be found at: <http://www.onetonline.org/crosswalk/CIP/>.

| | |
|------------|------------|
| 19-1020.01 | 29-1062.00 |
| 19-1029.00 | 29-1067.00 |
| 19-1029.02 | 29-1071.00 |
| 19-1042.00 | 29-1069.00 |
| 29-1051.00 | 29-1021.00 |

- b. Are any specific career codes (SOC/ONET codes) to be omitted from the CIP codes selected above? (i.e. "Omit 25-10312.00 Engineering Teachers, Postsecondary from CIP code 14.0501 Bioengineering and Biomedical Engineering.")

13. Area(s) of Interest

A. Select one (1) primary Area of Interest from the list below that applies to this program.

- | | |
|--|--|
| <input type="checkbox"/> Architecture, Construction & Design | <input type="checkbox"/> Engineering & Technology |
| <input type="checkbox"/> Artistic Expression & Performance | <input type="checkbox"/> Environmental Issues & Physical Science |
| <input checked="" type="checkbox"/> Biological Sciences, Health & Wellness | <input type="checkbox"/> Interdisciplinary Studies |
| <input type="checkbox"/> Business, Management & Economics | <input type="checkbox"/> Languages & Cultures |
| <input type="checkbox"/> Communication & Media | <input type="checkbox"/> Law & Justice |
| <input type="checkbox"/> Computing & Mathematics | <input type="checkbox"/> Social Science, Policies & Issues |
| <input type="checkbox"/> Education & Teaching | |

B. Select any additional Areas of Interest that apply to this program from the list below.

- | | |
|---|--|
| <input type="checkbox"/> Architecture, Construction & Design | <input type="checkbox"/> Environmental Issues & Physical Science |
| <input type="checkbox"/> Artistic Expression & Performance | <input type="checkbox"/> Engineering & Technology |
| <input type="checkbox"/> Biological Sciences, Health & Wellness | <input type="checkbox"/> Interdisciplinary Studies |
| <input type="checkbox"/> Business, Management & Economics | <input type="checkbox"/> Languages & Cultures |
| <input type="checkbox"/> Communication & Media | <input type="checkbox"/> Law & Justice |
| <input type="checkbox"/> Computing & Mathematics | <input type="checkbox"/> Social Science, Policies & Issues |
| <input type="checkbox"/> Education & Teaching | |



**2015 - 2016 Major Map
Biological Sciences (Biomedical Sciences), (Proposed)**

ULTOPXJ

| Term 1 0 - 15 Credit Hours Critical course signified by ♦ | Hours | Minimum Grade | Notes |
|--|-------|---------------|--|
| ♦ BIO 189: Life Sciences Career Paths | 1 | | <ul style="list-style-type: none"> • An SAT, ACT, Accuplacer, or TOEFL score determines placement into first-year composition courses • ASU Math Placement Exam score determines placement in Mathematics, Biology and Chemistry courses • ASU 101 or College specific equivalent First Year Seminar required of all freshman students. |
| ♦ BIO 281: Conceptual Approaches to Biology for Majors I | 4 | C | |
| CHM 113: General Chemistry I (SQ) | 4 | C | |
| ENG 101 or ENG 102: First-Year Composition OR ENG 105: Advanced First-Year Composition OR ENG 107 or ENG 108: First-Year Composition | 3 | C | |
| STP 231: Statistics for Life Science (CS) | 3 | C | |
| Term hours subtotal: | 15 | | |

| Term 2 16 - 32 Credit Hours Critical course signified by ♦ | Hours | Minimum Grade | Notes |
|--|-------|---------------|-------|
| ♦ BIO 282: Conceptual Approaches to Biology for Majors II | 4 | C | |
| ♦ MAT 251: Calculus for Life Sciences (MA) | 3 | C | |
| CHM 116: General Chemistry II (SQ) | 4 | C | |
| ENG 101 or ENG 102: First-Year Composition OR ENG 105: Advanced First-Year Composition OR ENG 107 or ENG 108: First-Year Composition | 3 | C | |
| Social and Behavioral Sciences (SB) | 3 | | |
| ♦ Complete ENG 101 OR ENG 105 OR ENG 107 course(s). | | | |
| Term hours subtotal: | 17 | | |

| Term 3 33 - 46 Credit Hours Critical course signified by ♦ | Hours | Minimum Grade | Notes |
|---|-------|---------------|---|
| ♦ BIO 340: General Genetics OR MBB 347: Molecular Genetics: From Genes to Proteins | 4 | C | <ul style="list-style-type: none"> • Students planning on attending medical school should take CHM 233/237 instead of CHM 231/235. |
| CHM 231: Elementary Organic Chemistry (SQ) AND CHM 235: Elementary Organic Chemistry Laboratory (SQ) | 4 | C | |
| CLAS Science and Society Elective | 3 | C | |
| Humanities, Fine Arts and Design (HU) | 3 | | |
| ♦ Complete First-Year Composition requirement. | | | |
| ♦ Complete Mathematics (MA) requirement. | | | |
| Term hours subtotal: | 14 | | |

| Term 4 47 - 61 Credit Hours Critical course signified by ♦ | Hours | Minimum Grade | Notes |
|--|-------|---------------|--|
| ♦ BIO 345: Organic Evolution | 3 | C | <ul style="list-style-type: none"> • Students planning to attend medical school should take CHM 234/238 instead of the elective in this term. • BIO 312 may be used to satisfy an upper division Science and Society credit for the College of Liberal Arts and Sciences provided it is not being used to satisfy an SB credit for general studies. • Some upper division Medicine in Society and Biomedical Research courses require lower |
| BIO 312: Bioethics (HU) | 3 | C | |
| Literacy and Critical Inquiry (L) | 3 | | |
| Social and Behavioral Sciences (SB) | 3 | | |
| Elective | 3 | | |
| Term hours subtotal: | 15 | | |

division prerequisites, which may be taken as electives. See list of Suggested Electives provided.

| Term 5 by ☆ | 62 - 75 Credit Hours Necessary course signified | Hours | Minimum Grade | Notes |
|-------------|---|-------|---------------|---|
| ☆ | BIO 353: Cell Biology | 3 | C | <ul style="list-style-type: none"> Optimal time for Study Abroad, schedule an advising appointment at https://solsadvising.asu.edu to discuss Study Abroad options. Students planning to attend medical school should take PHY 111 and PHY 113 instead of PHY 101. |
| ☆ | BIO 360: Animal Physiology | 3 | C | |
| | PHY 101: Introduction to Physics (SQ) | 4 | C | |
| | BCH 361: Advanced Principles of Biochemistry AND BCH 367: Elementary Biochemistry Laboratory | 4 | C | |
| | Term hours subtotal: | 14 | | |

| Term 6 by ☆ | 76 - 91 Credit Hours Necessary course signified | Hours | Minimum Grade | Notes |
|-------------|---|-------|---------------|--|
| ☆ | BIO 351: Developmental Biology OR BIO 420: Immunology: Molecular and Cellular Foundations OR BIO 440: Functional Genomics OR BIO 462: Endocrine Physiology OR BIO 467: Neurobiology | 3 | C | <ul style="list-style-type: none"> Optimal time for Study Abroad, schedule an advising appointment at https://solsadvising.asu.edu to discuss Study Abroad options. Students planning to attend medical school should take PHY 112 and PHY 114 instead of the upper division elective this term and add one additional upper division elective hour to term 8. Some upper division Medicine in Society and Biomedical Research Courses require prerequisites, which may be taken as electives. See list of Suggested Electives provided. |
| | Humanities, Fine Arts and Design (HU) | 3 | | |
| | Upper Division Humanities, Fine Arts and Design (HU) OR Upper Division Social and Behavioral Sciences (SB) | 3 | | |
| | Complete 2 courses: Elective | 6 | | |
| | Upper Division Elective | 1 | | |
| | Term hours subtotal: | 16 | | |

| Term 7 by ☆ | 92 - 107 Credit Hours Necessary course signified by | Hours | Minimum Grade | Notes |
|-------------|---|-------|---------------|--|
| ☆ | Upper Division Biomedical Research Course OR Upper Division Medicine in Society Course | 4-2 | C | <ul style="list-style-type: none"> Courses from the Medicine in Society and Biomedical Research groups must include at least one course from each group and at least one lab course. BIO/MIC/MBB/PLB 495 Undergraduate Research or an approved BIO/MIC/MBB/PLB 484 internship may substitute for one lab course. Some upper division Medicine in Society and Biomedical Research Courses require prerequisites, which may be taken as electives. See list of Suggested Electives provided. |
| | Upper Division CLAS Science and Society Elective | 3 | C | |
| | Historical Awareness (H) | 3 | | |
| | Cultural Diversity in the U.S. (C) | 3 | | |
| | Upper Division Literacy and Critical Inquiry (L) | 3 | | |
| | Term hours subtotal: | 16-14 | | |

| Term 8 by ☆ | 108 - 120 Credit Hours Necessary course signified by | Hours | Minimum Grade | Notes |
|-------------|---|-------|---------------|-------|
| ☆ | BIO 351: Developmental Biology OR BIO 420: Immunology: Molecular and Cellular Foundations OR BIO 440: Functional Genomics OR BIO 462: Endocrine Physiology OR BIO 467: Neurobiology | 3 | C | |
| ☆ | Upper Division Biomedical Research Course OR Upper Division Medicine in Society Course | 2-4 | C | |

| | |
|-------------------------|-------|
| Global Awareness (G) | 3 |
| Upper Division Elective | 3 |
| Elective | 2 |
| Term hours subtotal: | 13-15 |

- Some upper division Medicine in Society Courses require lower division prerequisites, which may be taken as electives. See list of Suggested Electives provided.
- All students pursuing a B.S. or B.S.P. degree in the College of Liberal Arts and Sciences must complete two courses from the Science and Society list found at <https://clas.asu.edu/advising-and-academic-services/science-and-society>. At least one of the two courses must be upper division. Students must earn a C or better in the courses, and no more than one of the two can also be used to simultaneously fill a requirement of the major, minor or related area. Science and Society courses cannot also be used to fill the general studies HU, SB, SQ or SG requirements.

| Medicine in Society | Biomedical Research | Suggested Electives |
|--|--|--|
| ASB 301: Global History of Health (SB & G & H) | BIO 342: General Genetics Laboratory | ASB 100: Introduction to Global Health (SB & G) or SSH 100: Introduction to Global Health (SB & G) |
| ASB 355: Traditional Medicine and Healing (HU or SB) | BIO 343: Genetic Engineering and Society (L) | ASB 102: Culture in a Globalizing World (SB & G) |
| ASB 443: Cross-Cultural Studies in Global Health (L or SB) & G | BIO 352: Laboratory in Vertebrate Developmental Anatomy | ASB 222: Buried Cities and Lost Tribes ((HU or SB) & G & H) |
| ASB 452: Community Partnerships for Global Health (SB) | BIO 355: Introduction to Computational Molecular Biology (CS) | ASB 223: Aztecs, Incas and Mayas ((HU or SB) & G & H) |
| ASM 345: Disease and Human Evolution | BIO 361: Animal Physiology Laboratory | ASM 104: Bones, Stones, and Human Evolution (SB or SG) |
| BIO 302: Cancer--Mother of All Diseases (L) | BIO 415: Biometry (CS) | BIO 331: Animal Behavior |
| BIO 311: Biology and Society | BIO 435: Research Techniques in Animal Behavior | BIO 455: Introduction to Comparative Genomics or BMI 465: Introduction to Comparative Genomics |
| HPS 331: History of Medicine (H) | BIO 450: Advanced Developmental Biology | HST 101: Global History Since 1500 (HU & H & G) |
| SSH 401: Health and Human Biology | BIO 451: Cell Biotechnology Laboratory | MBB 445: Techniques in Molecular Biology/Genetics or MIC 445: Techniques in Molecular Biology/Genetics |
| SSH 404: Medical Anthropology: Culture and Health (SB & C) | BIO 455: Introduction to Comparative Genomics | MIC 420: Immunology: Molecular and Cellular Foundations |
| | MIC 421: Experimental Immunology | |
| | MIC 425: Advanced Immunology | |
| | MBB 446: Techniques in Molecular Biology/Genetics Lab or MIC 446: Techniques in Molecular Biology/Genetics Lab | |

Notes:

- Please keep in mind that the applicability of a specific transfer course toward an ASU degree program depends on the requirements of the department, division, college or school in which you are enrolled at ASU. Transfer agreements that guarantee the completion of university level requirements do not necessarily meet college and major requirements. Please consult with an advisor for more information.

Total Hours: 120
Upper Division Hours: 45 minimum
Major GPA: 2.00 minimum
Cumulative GPA: 2.00 minimum
Total hrs at ASU: 30 minimum
Hrs Resident Credit for Academic Recognition: 56 minimum
Total Community College Hrs: 54 maximum

General University Requirements Legend

General Studies Core Requirements:

- Literacy and Critical Inquiry (L)
- Mathematical Studies (MA)
- Computer/Statistics/Quantitative Applications (CS)
- Humanities, Fine Arts and Design (HU)
- Social and Behavioral Sciences (SB)
- Natural Science - Quantitative (SQ)
- Natural Science - General (SG)

General Studies Awareness Requirements:

- Cultural Diversity in the U.S. (C)
- Global Awareness (G)
- Historical Awareness (H)

First-Year Composition

General Studies designations listed on the major map are current for the 2015 - 2016 academic year.

Julie Ramsden

From: Paul LePore <Paul.Lepore@asu.edu>
Sent: Friday, April 11, 2014 2:03 PM
To: curriculumplanning@asu.edu
Cc: Jenny Smith; Paul LePore
Subject: Biomedical Sciences Concentrations within the BS in Microbiology & BS in Biological Sciences
Attachments: Medical Microbiology Concentration_MO.docx.doc; Microbiology Curriculum Structure.docx; Microbiology- Biological Sciences Description 150 words.docx; Major Map Biomedical Sciences - BS Microbiology.pdf; Letters of support - Micro.pdf; Biomedical Sciences Concentration_Final.doc; Biological Sciences Related Area.docx; Biological Sciences 150 word description.docx; Major Map Biomedical Sciences - BS Biological Sciences.pdf; Letters of Support - Biological Sciences Con..pdf

Please accept the attached proposals to establish two new undergraduate concentrations in Biomedical Sciences.

Thank you!

Paul

PAUL C. LEPORE, Ph.D.

Associate Dean

College of Liberal Arts and Sciences

Foundation Building, Suite 110

Arizona State University | P.O. Box 876605 | Tempe, Arizona 85287-6605

480.965.6506 | Fax: 480.965.2110 | e-mail: paul.lepore@asu.edu

ASU College of Liberal Arts and Sciences — *Transforming learning, discovery and lives*

ASU SCHOOL OF
Life Sciences
ARIZONA STATE UNIVERSITY

TO: CLAS Curriculum Committee

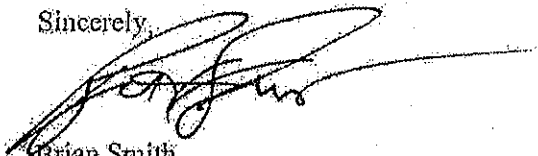
FROM: Brian H. Smith, Director
School of Life Sciences

DATE: March 11, 2014

SUBJECT: Biomedical Sciences Concentration

The concentration in Biomedical Sciences within the Biological Sciences degree program was developed and approved by the School of Life Sciences Undergraduate Programs Committee. The proposed concentration will integrate well with our existing programs and will require few additional teaching resources. The concentration will benefit our students and has my support.

Sincerely,



Brian Smith
School Director and Professor
School of Life Sciences
Arizona State University

Physics Confirmation

Katelyn Cooper

To: Scot Schoenborn
Subject: RE: Impact statement-new concentration in SOLS

From: Ixchell Paape <Ixchell.Paape@asu.edu>
Date: March 13, 2014 at 12:35:21 PM MST
To: Scot Schoenborn <Scot.Schoenborn@asu.edu>
Cc: Miles Orchinik <m.orchinik@asu.edu>, Morgan Texeira <Texeira@asu.edu>, Stuart Lindsay <STUART.LINDSAY@asu.edu>
Subject: RE: Impact statement-new concentration in SOLS

Hello Scot -

No objections from physics. Thank you for keeping us in the loop.

From: Scot Schoenborn
Sent: Thursday, March 13, 2014 8:44 AM
To: Ixchell Paape
Cc: Miles Orchinik
Subject: impact statement-new concentration in SOLS

H Ixchell-

The School of Life Sciences is looking to propose two new concentrations for Fall 2015: Medical Microbiology and Biological Sciences; Biomedical Sciences.

I have attached the two proposals and wanted to see if you had any objections. Basically, these concentrations would follow similar models in requiring either one semester (PHY 101) or 1 year (PHY 111/113 and PHY 112/114) of general physics.

CLAS requested we run this by you to make sure you do not object. At this point, it is hard to say if this will increase our overall enrollment or simply shift student preferences in concentrations within SOLS.

With that said, any objections?

Scot Schoenborn
Associate Director of Academic Services
School of Life Sciences
Arizona State University | P.O. Box 874701 | Tempe, Arizona 85287-4701
480.965.3721 | Fax: 480.965.3562 | email:
scot.schoenborn@asu.edu
<http://sols.asu.edu>
Schedule your advising appointment online at solsadvising.asu.edu

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School of Human Evolution and Social Change Confirmation

Scot Schoenborn

From: Scot Schoenborn
Sent: Tuesday, March 11, 2014 12:52 PM
To: Alissa Ruth
Cc: Miles Orchinik; Katelyn Cooper; Kelly Knudson; Alexandra Brewis Slade
Subject: RE: New concentration in SOLS

Thanks for your feedback Alissa-

Yes, I can make the changes you request.

Sincerely,

Scot Schoenborn
Associate Director of Academic Services
School of Life Sciences
Arizona State University | P.O. Box 874701 | Tempe, Arizona 85287-4701
480.965.5721 | Fax: 480.965.3562 | email:
scot.schoenborn@asu.edu
<http://sols.asu.edu>
Schedule your advising appointment online at solsadvising.asu.edu

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[The SOLS academic services office seeks to support the mission of the university by empowering and supporting students so that they achieve their full educational, career goals, and potential through quality academic advising and other student-centered services]

From: Alissa Ruth
Sent: Tuesday, March 11, 2014 11:13 AM
To: Scot Schoenborn
Cc: Miles Orchinik; Katelyn Cooper; Kelly Knudson; Alexandra Brewis Slade
Subject: RE: New concentration in SOLS

Hi Scott,

Thanks for contacting us, I am copying Kelly Knudson who is working with me on curriculum now. All these courses look good, and we may be adding more onto the books in the next year or two. Please be aware that these classes aren't always offered during the regular semester, although we do tend to offer many of them online in the summer, and on our summer study abroad programs. Lastly, two things: 1) can you be sure to list the x-lists of the SSH courses that are ASD and ASM (bc these are more recognized and we offer more seats in these); 2) you have SSH 404 listed twice.

Best,
Alissa

Here is the list of courses with x-lists:

ASB 345 Disease and Human Evolution 3
ASB 355 Traditional Medicine and Healing 3
ASB 462/SSH 404 Medical Anthropology: Culture and Health 3
SSH 301 (crosslisted as ASB301 and HST 301) Global History of Health 3
ASM 401/SSH 401 Health and Human Biology 3
ASB 452/SSH 402 Community Partnerships for Global Health 3
SSH 403 (crosslisted as ASB443) Cross Cultural Studies in Global Health 3

Here is the list of courses with s-lists:

ASB 345 Disease and Human Evolution 3
ASB 355 Traditional Medicine and Healing 3
ASB 462/SSH 404 Medical Anthropology: Culture and Health 3
SSH 301 (crosslisted as ASB301 and HST 301) Global History of Health 3
ASM 401/SSH 401 Health and Human Biology 3
ASB 452/SSH 402 Community Partnerships for Global Health 3
SSH 403 (crosslisted as ASB443) Cross Cultural Studies in Global Health 3

ALISSA RUTH
Director of Student and Academic Services
School of Human Evolution and Social Change
College of Liberal Arts and Sciences
Arizona State University | P.O. Box 872402 | Tempe, Arizona 85287-2402 | SHESC Bldg. #204
480.965.4628 | Fax: 480.965.7671 | e-mail: alissaruth@asu.edu | web page: www.shesc.asu.edu

From: Scot Schoenborn
Sent: Tuesday, March 11, 2014 10:39 AM
To: Alissa Ruth
Cc: Miles Orchinik; Katelyn Cooper
Subject: New concentration in SOLS

Hi Alissa-

We're sending a proposal for a new concentration in SOLS, Biological Sciences: Biomedical Sciences. We would like to list some of your coursework as options for our students.

Students must pick one course from the following list (which includes some of your courses)

Chemistry & Biochemistry statement of support

Jenny Smith

From: Scot Schoenborn
Sent: Monday, March 24, 2014 8:35 AM
To: Jenny Smith
Cc: P.F. Lengel; Miles Orchinik; Katelyn Cooper
Subject: FW: Impact statement-new concentration in SOLS

Hi Jenny-

We heard back from Chemistry regarding our intention to create two new concentrations(below). Would you like me to scan this and send to you, or is this sufficient?

Scot Schoenborn

Associate Director of Academic Services

School of Life Sciences

Arizona State University | P.O. Box 874701 | Tempe, Arizona 85287-4701

480.965.3721 | Fax: 480.965.3562 | email:

scot.schoenborn@asu.edu

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From: Wilson Francisco
Sent: Sunday, March 23, 2014 4:15 PM
To: Scot Schoenborn
Cc: Miles Orchinik
Subject: Re: Impact statement-new concentration in SOLS

Dear Miles and Scot,

After careful consideration, the Department of Chemistry and Biochemistry is pleased to support the implementation of the two new concentrations (Medical Microbiology and Biological Sciences: Biomedical Sciences) by the School of Life Sciences. The Department of Chemistry and Biochemistry will be able to accommodate any increase in enrollment in our chemistry (e.g. CHM 113, 116, 231, 235, 233, 234, 237, 238) and biochemistry (BCH 361 & 367) courses that results from the implementation of these two programs.

Best regards,

Wilson

Wilson A. Francisco, PhD

Associate Professor and Associate Chair